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ABSTRACT

The Elk Range located in the very center of the Colorado Rocky Mountains is described in this guide to the Maroon Bells-Snowmass Wilderness Area. Near the ghost town of Marble, Colorado, this wilderness area is described as 66,000 acres 150 miles outside Denver encompassing 25% of all established wilderness in Colorado, 130 miles of marked trails, and the largest number of 14,000 foot peaks of any comparable area of Colcrado. Information relative to outdoor and environmental education is presented as follows: geology; weather; principles of ecology; life zones; animals; historical impact of man; the current day (sheep grazing in the Wilderness Area and the use of poisoned bait to kill off sheep predators, ski area expansion, and future problems); Outward Bound's use of the Wilderness Area (a wilderness code). Also included is an appendix which presents: information re: the the recognition of common trees; a checklist of common wildflowers; an animal checklist; and a list of natural foods. (JC)

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An Environmental Handbook of the Marble Area

Dan Campbell

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AN ENVIRONMENTAL HANDBOOK OF THE MARBLE AREA

by
Dan Campbell

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from: Colorado OUTWARD BOUND School
P.O. Box 7247
Denver, Colorado 80207

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[1974]

A LAND ETHIC

I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived.

Henry David Thoreau

One of the best-paying professions is getting ahold of pieces of country in your mind, learning their smell and their moods, sorting out the pieces of a view, deciding what grows there and why, how many steps that hill will take, where this creek winds and where it meets the one below, what elevation timberline is now, whether you can walk this reef at low tide or have to climb around, which contour lines on a map mean better cliffs or mountains. This is the best kind of ownership, and the most permanent. It feels good to say, "I know the Sierra" or "I know Point Reyes." But of course you don't - what you know better is yourself, and Point Reyes and the Sierra have helped.

Jerry and Renny Russell

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

Aldo Leopold

TABLE OF CONTENTS

Foreword.....ii

Introduction.....iv

1. Geology..... 1

2. Weather..... 4

3. Principles of Ecology..... 5

4. Life Zones..... 9

5. Animals.....13

6. Historical Impact of Man.....17

7. The Current Day.....25

8. OUTWARD BOUND's Use of the Wilderness Area: A Wilderness Code.....34

APPENDIX

I. How to Recognize the Common Trees.....37

II. Checklist of Common Wildflowers.....39

III. Animal Checklist.....40

IV. Natural Foods.....41

INTRODUCTION

Where you are...

The Rocky Mountain system is the longest mountain chain on the planet. It girds the earth from the Brooks Range in Alaska through the Canadian Rockies, the Rocky Mountains of the United States and the Sierra Madre Orientals of eastern Mexico. It was thrust up between sixty and seventy million years ago, at a time when the climate of the earth was cooling, dinosaurs were vanishing and mammals were becoming dominant.

The Colorado Rockies have the unique distinction of being in the very center of this massive chain, and in many ways Colorado is a microcosm of the whole. Plants and animals from both north and south have migrated through the Colorado Rockies during millions of years, giving the area a unique blend of flora and fauna. In addition, Colorado serves as the hub for six great river systems which radiate out across the country. From the glaciers and snowdrifts of Colorado's high mountains arise the Missouri River which flows into the Mississippi, the Columbia and its main tributary, the Snake; the Colorado and its tributaries, the Green, Crystal, and Gunnison; the Arkansas and Platte which both flow eastward across the Great Plains; and the Rio Grande which empties into the Gulf of Mexico. With this kind of far-reaching influence, in a real sense whatever befalls Colorado, so goes the nation.

To sharpen the focus yet further, this handbook deals only with the Elk Range in the very center of the Colorado Rockies. The Elk Range includes some of the most spectacular scenery in all of Colorado. Included are six of the fifty-two stately 14,000-foot peaks which give Colorado its fame: Maroon Peak, Castle Peak, Snowmass Mountain, Capitol, Pyramid, and Mt. Sopris, which towers over Aspen. The crest of the Elk Range runs for nineteen miles without dipping below 12,400 feet. In the very center of the Elk Range, as though the navel of the entire Rocky Mountain system, lies the Maroon Bells-Snowmass Wilderness Area.

Colorado OUTWARD BOUND School is located above the near-ghost town of Marble, Colorado, nestled in the Elk Range 150 miles from Denver. The elevation of the school is 9,000 feet, with nearby peaks rising over 14,000 feet. OUTWARD BOUND School adjoins the Maroon Bells-Snowmass Wilderness area which encompasses one-fourth of all established wilderness in Colorado (66,000 acres). It has 130 miles of marked trails and the largest number of 14,000-foot peaks of any comparable area of Colorado. The nearest towns of any size are Aspen and Glenwood Springs.

1. GEOLOGY

The Maroon Bells wilderness is a geologist's wonderland. In this small area one can take a tour of the geology of the entire Rocky Mountain chain in a day's hike. Perhaps most striking is the convergence of two mountain groups of widely different origin and startling colors. The Maroon Bells, known among Colorado mountain climbers as the Death Bells, are composed of crumbling purplish sandstone laid down by an ancient river nearly 275 million years ago. Geologists believe that the Maroon Formation is sedimentary strata formed by the erosion of the Ancestral Rockies, a now-leveled mountain range which paralleled the present-day Rockies. Running east-west and molding smoothly into the Maroon Bells is another group of high peaks. In contrast to the maroon color of the sandstone, these peaks are made of glaring white granodiorite, an igneous rock spewed out of cracks in the earth's crust. In 1908 Percy Hagerman, one of Colorado's first hard-rock climbers, noted in his journal, "The combination of this light-colored volcanic rock with the deep purples and red of the sedimentary formation makes a variety of landscapes not to be equalled anywhere in the world."

But perhaps even more breathtaking than these two blocks is a solid mountain of glistening white marble formed as the intense heat of the intruding granite recrystalized layers of ancient limestone. The deposit, known as Yule Marble, is thought to be the largest bed of the world's finest grade of marble, superior even to the famed Carara marble of Italy. Except for the prohibitive cost of quarrying the Yule deposits, the ghost town of Marble would be a boom town.

Geologic History

The oldest and deepest rock in the area, called the basement rock, is composed mainly of metamorphic gneisses and schists. They were derived from sedimentary rocks such as sandstone and shale being subjected to tremendous heat and pressure. This period of metamorphism took place between 1.4 and 1.7 billion years ago. The only visible evidence of these rocks in the immediate area can be found on the east side of Treasury Mountain.

Before the Cambrian Period, about 600 million years ago, the whole area was eroded to a flat plain and covered by a shallow sea. It was about this time that life became abundant and numerous fossils were formed. Deposition of sandstone limestone, and shale occurred in this shallow sea over the next 200 million years. This extensive sequence of sediment is visible in White House Mountain seen from the OUTWARD BOUND base camp at Marble.

The Ancestral Rockies uplifted southwest and northwest of Marble about 350 million years ago. This now-extinct mountain range was worn away by the insistent erosion of several rivers. They carried away sand and pebbles which eventually formed the thick sequence of red sandstone and conglomerates of the Maroon Bells.

A period of local erosion followed and eventually the sea returned, creating a layer of black shale (called Mancos Formation) that reached 10,000 feet deep in some areas. The town of Marble sits on beds of Mancos shale This period of deposition was followed by a sequence of sandstone, shale and coal which indicates that swamps and lazy rivers once covered large areas around Marble.

Volcanic activity began in the area about 75 million years ago along with small amounts of uplift. This was the beginning of the Laramide Period, a name given to the era of great mountain-building throughout North America when the Rockies and Sierras were formed. Between twelve and thirty-five million years ago large bodies of granite pushed up through the sedimentary layers causing folding, faulting and doming of the material above it. Treasury Mountain opposite OUTWARD BOUND School is a large dome of Precambrian basement forced up by a body of granite. Snowmass Mountain and Capital Peak were formed where this granite broke through to the surface.

These great granite intrusions caused metamorphism by heat. Where it came in contact with the molten granite, limestone was recrystallized into pure white marble; sandstone hardened into quartzite; shale into hornfels (a good example of hard, flinty hornfels can be seen on the north side of Schofield Pass); and a very hard coal was formed, the only North American occurrence of anthracite coal west of Pennsylvania.

Also associated with the intrusion of the granite was a water-rich acid solution which permeated the surrounding rocks, dissolving metallic elements such as lead, zinc, silver, gold, molybdenum, copper and iron. These metals then deposited in fissures and cracks, forming the veins so prized by early miners. Some of these veins can be seen on the way to the first rappel at the base of White House Mountain.

The finishing touches of the spectacular sculptured landscape of the Maroon Bells wilderness were applied a million years ago during the Great Ice Age. As great flows of thick ice coursed down to lower elevations, wide U-shaped valleys were carved. The Elk Range thrusts up through these lush green glacial valleys as a great ragged knife cutting its way to the clouds. Over-steepened cliffs give way to frequent rumbling landslides, building talus slopes of boulders which descend to the treeline. Scattered throughout these massive boulder fields are cirques and tarns which hold back melting snow water and are often thick with ice until August. Such glacial lakes are often found at many levels in the high valleys, looking like the beads of a rosary, hence the name "paternoster" lakes.

The material carried by glacier (called till), ranging in size from sand to boulders, was deposited along the valleys in formations known as moraines. The OUTWARD BOUND School is located on a lateral moraine, a shelf formed at the upper edge of a moving glacier. Other evidence of the glaciers are long scratches or striations left on solid rocks (some can be seen on the beginning climbing slabs used in the first week of the course). Although the true glaciers are gone now, there are still active rock glaciers. These are piles of loose rock, from dust-size to huge blocks, which are cemented together by ice. These rock glaciers move much as the ice glaciers did and create very steep and dangerous slopes.

Though the glaciers are gone now, there is still a great deal of ongoing geologic activity. River-cutting, mudslides, floods, and landslides are continually changing the appearance of the Rockies. Carbonate Creek and Slate Creek above the town of Marble have been the sources of several devastating mudslides throughout recent history. The over-steepening of cliffs by glaciers account for much of this

present-day activity. When a slope is steeper than 35° (called the angle of repose), vegetation cannot hold its own against the movement of talus slopes and rock glaciers.

Although much of the early exploration and development of the Maroon Bells-Snowmass area centered around mining valuable ores, it has not proved to be very profitable. The marble quarries, discussed later, have produced more income than all other mines combined. Lead and zinc were the chief valuable ores extracted from the area, though combined they probably produced no more than two million dollars worth of ore. The bulk of the ore came from four mines: the Eureka on Treasure Mountain; the North Pole mine in North Pole Basin; the Black Queen on Sheep Mountain; and Lead King in Lead King Basin. Each of these also produced small quantities of silver and copper. The Lead King, discovered in 1902, was the largest in the district and is still producing today. Now, as a one-man operation, the Lead King has a 1,600-foot shaft and produces low-grade ore (copper and zinc) from June to November. A small amount of gold was removed from a mine a few hundred yards east of Lizard Lake in the 1930's.

2. WEATHER

The climate of the Marble area is considered "continental" and, typical of most inland mountainous areas, is subject to extreme changes of temperature and weather conditions hour to hour and day to day in any season of the year. Temperatures can range from thirty below zero in the winter to the pleasant seventies in the summer.

The western slope of Colorado is on the windward side of the prevailing westerly winds and receives a considerable amount of snow in the winter and rain in the summer. The Marble area is isolated by snow from October to April with frequent avalanches occurring in the valley areas (the five-mile valley between Marble and Crystal is virtually impassable during most of the winter). The snow piles up as deep as fifteen feet in many areas, and one record blizzard in 1921 dropped six feet of snow in one day. By May the south slopes begin melting and streams become torrents requiring great care in crossing. Avalanches are particularly dangerous during this season. Avalanche-prone areas can be recognized in the summer by steep slopes covered with flexible

willows and young aspen. The nights of May and June are cool but days are sunny and warm. The rainy season begins early in July (when daily afternoon cloudbursts are common) and continues well into August. Late in August snow becomes more common and by September snow is the rule.

Most of the intense cold fronts come in from the north, filling the valleys with cold, dark clouds. They can often be predicted early by high stratus clouds which form as the warm air is squeezed upward. This weather is sometimes accompanied by eerie inversions where the high ridges are sunny and bright while lower valleys are cold and dark. Such cold-front storms often leave a considerable amount of precipitation.

Warm Pacific air masses enter Colorado from the west and are often accompanied by strong winds. Under certain conditions these westerly winds produce sudden unseasonably warm conditions called chinooks. Gulf air masses from the south also bring warm air, but also bring violent cloudbursts and lightning storms. They are caused when subtropical air from the Gulf of Mexico is pulled northward to the mountains by the low pressure areas of New Mexico. As these winds rise above the mountains and meet cool air they drop a heavy load of precipitation.

Lightning usually strikes solitary trees and exposed rocks. As a general rule if you are on a high ridge when a lightning storm approaches, it is a good policy to simply scramble down to lower ground. If caught, avoid promentories and damp areas which might conduct ground current. Sit on your pack (frame down) and avoid touching the rocks around you. A clap of thunder following a lightning bolt by seven seconds means it is one mile away.

3. PRINCIPLES OF ECOLOGY

Though noted for the grandeur of its mountains and geology, Colorado is possibly even more interesting to the biologist. For millions of years species of plants and animals have migrated through Colorado producing a mixture of flora and fauna rivaled in few other parts of the world. Speaking of his particular field of interest Dr. Paul Erlich said, "The Maroon Bells-Snowmass Wilderness is unequaled in the United States for its great diversity of

butterflies. Elements of the Arctic, Great Basin, Great Plains, and Southwestern Desert fauna converge in this area and make it probably the richest comparable area in the U. S."

Knowledge of a few basic principles of ecology and their application in the mountains can enhance your outdoor experience considerably. Let us consider three principles: the law of succession; the effects of limiting factors; and the ecosystem division of wildlife.

The Law of Succession

This law states simply that whenever an area is disturbed (e.g. by avalanche, fire, logging, etc.) the first community of plants to move into it (the pioneer community) is eventually replaced by a second and then subsequent stages until a stable growth (the climax community) takes over. Examples of disturbed areas and successional stages abound in this area. The nearest example is the large stand of aspen trees that surround the OUTWARD BOUND School. The aspen is frequently the pioneering tree to become established when the dominant conifers are disturbed. In the case at Marble, aspens moved in when the pines were logged out. Eventually the aspen will be replaced by another climax conifer forest.

Another common example of ecological disturbance in the area is the destruction caused by avalanches in the Crystal River Valley between Marble and Crystal. Frequently areas below steep slopes and gorges will have very little vegetation except willows and wildflowers, while gentler neighboring slopes are heavily timbered. Avalanches can effectively remove the typical climax community and create an artificial climax of plants which bend under the weight of the snow.

A third common example of succession can be seen in the in-filling of many alpine lakes. As sediment is washed into mountain lakes they become shallower and often develop deltas near the mouths of streams. As these changes continue, the living conditions are changed and new communities of plants will develop. Throughout many years a lake may progress from a deep lake to a shallow lake to a swampy and marshy area and eventually to dry land covered with grasses

and even trees. During this process the plant communities may succeed from algae and mosses to grasses and sedges, then to willows and aspen and finally to spruce and fir communities. Geneva Lake and the meandering stream and willow bog below it show several stages of lake succession. A good part of Geneva Lake has already been filled in and become dry ground.

Limiting Factors

There are, as one might expect, certain minimum limiting conditions which must be met for a plant or animal to survive in any particular place. There must be sufficient water, light, soil, and a suitable range of temperatures. The minimum conditions for survival vary with the specific organism; for example, palm trees and Douglas firs have very different minimum survival conditions. There are also maximum limits on survival conditions; for instance, too much sun, water, or wind (consider the plants above timberline) will exclude certain organisms. Thus, for every living thing there is a range within which the limiting factors must lie in order for it to survive.

While you are walking along the trail it might be interesting to make notes of the special needs that certain plants and animals have. For example, red columbines seem to prefer shady areas with pine-needle soil while blue columbines prefer open sunny meadows. The willow and maple require lots of water while pines favor dry areas. A twist on this exercise is to learn to unravel the mystery of unusual occurrences. For instance, what limiting factors cause that distinct line of trees on that far hill? What causes the sharp contrast of vegetation zones in this valley? Why do certain lichens appear only on the tops of rocks while others only in the shade below? Through this practice you will sharpen your powers of observation and learn a lot about ecology without needing books or formal courses.

Ecosystems

One of the significant observations that you might make on your tour of the mountains is that certain plants and animals are nearly always associated with specific environmental conditions. The three of these together (plants,

animals and environment) constitute an ecosystem. The term is used to describe an area where a predictable assemblage of plants and animals have adapted to a specific set of limiting factors. For instance, a mountain meadow, stream and forest are separate ecosystems with distinct organisms. A simple hike between two valleys might take you through four ecosystems - the valleys, the ridge top, and the north- and south-facing slopes. Each area has its own limiting factors and, therefore, different plants and animals.

From a distance the green slopes of the Rockies look like a dark band of conifers bordered by silver-gray tundra above and yellow-green grasslands below. Each of these zones appears homogenous and sharply delineated. However, a closer look shows a great deal of diversity within each area and large fingers and islands of some communities extending far into others. Grassy meadows and aspen groves are scattered throughout, and the composition of conifer forests varies widely. The landscape is actually a finely-worked mosaic of small ecosystems covering the land with infinite variations of shade and texture.

The great variety of plant and animal communities in the mountains has many causes, including differences in altitude, weather, moisture, soil, sunlight, and man's impact. To the trained observer this assemblage is not haphazard. There are four broad zones of vegetation with predictable groupings of plants and animals. These large ecosystems, or life zones, can be recognized easily by remembering ten or twelve key trees. (See Appendix.) The four life zones of the mountains are known as Foothill, Montane, Sub-alpine, and Alpine Tundra. They are divided according to their altitude. The higher the elevation, the more severe the weather, causing plants and animals to adapt to climates usually found further north. For example, in the Montane Zone at 8,000 feet you will find plants which usually grow in Montana and Canada at 5,000 feet. A two-thousand-foot rise in altitude is equivalent to traveling ten degrees north in latitude. Some of the limiting factors which affect the composition of the different life zones are:

Altitude. The higher zones intersect different types of weather; for instance, the Sub-alpine is often bathed in clouds.

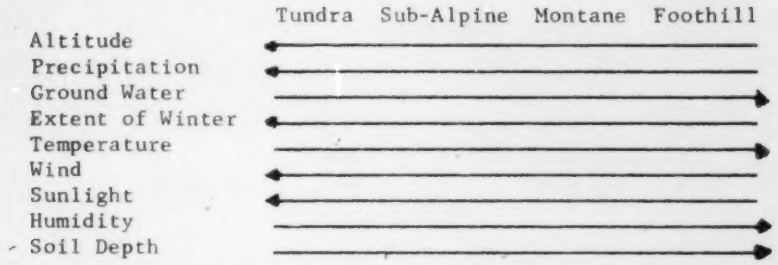
Topography. Even along the same contour, changes in topography affect exposure to sun and wind.

Soil depth. Valleys tend to have deep, fine-textured soil while ridges have shallow, rocky soil.

Weather. High areas receive more snow and freezing temperatures.

Man's impact. Mining, logging, grazing, and forest fires are more likely in lower elevations.

The following diagram might help describe some of the complex interrelationships at work in the four life zones. Each arrow points to the maximum occurrence of a given limiting factor.



4. LIFE ZONES

The Foothill Zone. 5,500 to 8,000 feet.

The first life zone that one encounters on the way up into the mountains from the plains is called the Foothill Zone. This zone is usually first seen between five and six thousand feet and is characterized by groves of forty-foot conifers interspersed with clearings of dry bunch grasses. In the forests ponderosa pine and Douglas fir are dominant, with sparse shrubs and grasses at their feet. The acidic nature of pine-needle soil tends to discourage a dense understory. Different soil types and topography determine whether an area will be covered by grassland or trees. Repeated brush fires and deep soil favor the grassland, while coarse and rocky soil with outcrops encourages conifers.

The north sides of hills (which are shady and moist) are usually blanketed with thick forests while the south sides are often open grassy parks.

Topographically, the Foothill Zone is characterized by broad, flat ridges with deep, narrow valleys where streams cut steep gorges. There is a soil gradient from very large particles on the high ridges to deep fine soil in the valleys. The deepest soil (and hence grassy meadows) occurs where small tributary valleys enter main valleys. In these areas the narrowleaf cottonwood and Colorado blue spruce compete with grasses. However, all vegetation communities in the Foothill Zone have been thoroughly altered by lumbering, fire, grazing, and mining.

Skirting around the edges of the Foothill meadows can be seen mule deer, black bear, bobcats, coyote, badger, skunk, rabbits, beaver, red and gray foxes, turkeys, hawks, eagles, and sage grouse.

The Montane Zone. 8,000 to 9,300 feet.

As the altitude increases the forests become thicker and grasslands dwindle. The vegetation of the Montane Zone consists of open to dense forests of Douglas fir and ponderosa pine, often interspersed with large stands of aspen and lodgepole pine. This zone is denser than the Foothill below it and contains several new species. Herbs and grasses are usually concentrated around lakes, ponds, and other wet areas. Open meadows often support a community of corn lilies, cow parsnip, willows, and the exquisite blue columbine (Colorado's state flower).

Aspen and lodgepole are the only trees covering wide areas of land disturbed by lumbering and forest fires. The Marble base camp is located in the center of a typical Montane aspen forest. Aspen is the only broad-leafed deciduous tree to form extensive stands in the high country. They grow best in moist areas but will grow as scrubby, dwarfed trees in dry areas. Even in dense stands they still allow enough sunlight to penetrate to the forest floor to allow a thick carpet of herbs and shrubs. The shady recesses of the Montane forest hide brilliant red columbines, dainty violets, the fiery calypso orchid and ground-covering juniper and kinnikinnick. The aspen is unable to grow in

its own shade, and thus a stand soon gives way to saplings of Douglas fir and ponderosa pine, until only a few aspen are left. Remaining dormant underground for many years, the aspen's roots grow rapidly after a fire or logging, making the aspen one of the first trees to reforest a disturbed area.

Another pioneering tree, the lodgepole pine, forms stands so thick that it is sometimes impossible to walk through them. The canopy is so tight that nearly all other plants are excluded. Douglas fir and ponderosa pine eventually replace the lodgepole because it cannot grow in its own shade.

Typical animals of the Montane Zone include mule deer, elk, beaver, mink, weasel, red and gray fox, black bear, bobcat, mountain lion, coyote, mountain sheep, marmot, badger, porcupine, bald eagle, blue grouse, red-tailed hawk, mountain bluebird and Stellar's jay.

Sub-Alpine Zone. 9,300 feet to timberline.

The Sub-Alpine Zone is one of the lushest forests in the state. It receives more precipitation than the other zones (about 30 inches per year) because it lies at a level where the mountains intercept clouds. It is usually covered by a uniform forest of dense sub-alpine fir, Englemann spruce, and scattered stands of limber pine (which occur in several zones). The Englemann spruce typically constitute about three-quarters of the population, and may range in size up to 100 feet high and three feet in diameter. Aspen and lodgepole stands cover broad scars where forest fires and logging have extended to higher elevations. In the main, however, due to the remoteness and rough terrain of the Sub-Alpine, it has been molested little by man's logging and fires. Well known for its flower fields, high meadows produce giant gentians, Indian paintbrush, avalanche lilies, and marsh marigolds. Ecologists frequently study the Sub-Alpine as it is one of the most untouched ecosystems left in the United States.

The Sub-Alpine is characterized by small lakes, long lateral moraines, and U-shaped valleys of the glaciers. Boggy areas surround many of the lakes and areas where glacial gravel has blocked off the natural drainage. The

climate of the area is relatively harsh with short, stormy summers and long, cold winters. The snow remains on the ground late into the spring, especially on northfacing slopes, making access difficult.

Some of the animals you may see in the Sub-Alpine include: elk, mule deer, snowshoe hare, fox, weasel, marten, beaver, coyote, porcupine, marmot, bobcat, white-crowned sparrows, grosbeaks, and bald eagles.

Alpine Tundra Zone. Above timberline (approximately 11,400)

The plant and animal community above timberline (approximately 11,400 feet), known as the Alpine Tundra, is one of the most interesting on earth. Here, where the wind lashes relentlessly and ice thaws only for a brief couple of months, trees are unable to survive. The plants of the Tundra like their relatives to the far north are dwarfed plants which nestle down into the leeward recesses of rocks. They include perennial sedges, grasses, herbs, and dwarfed shrubs. Many of the flowers appear as small rosettes and cushions with disproportionately large flowers of brilliant hues, urgently attracting pollinators before the snow falls again.

The tundra plants are found growing in pockets of fine soil scattered through a matrix of boulders. Severe winter blizzards cover the plants with snow most of the year. Oddly, this blanket of snow is the Tundra's most important defense. Under the snow the plants are protected from the bitter wind; above it they are pruned back and killed. Right at timberline there is often a fringe of wind-sculptured dwarfed trees (usually Englemann spruce) called krumholz. Beyond the protected dwarfed plants are great slabs of rock which can be colonized only by the hardy lichens. The presence of lichens on the rocks of a boulder field tells a mountaineer that the rocks are probably stable. Bare rocks mean that they are loose and dangerous.

One of the most significant forces shaping the landscape of the Tundra is frost. Ground moisture together with lengthy periods of cold creates a frozen soil known as permafrost. As ice forms in the wet soil, the soil's volume increases creating pressure on loose rocks within and eventually expelling them. The rocks which have been heaved

out of the soil often form unusual polygonal patterns and hummocks. As the soil thaws it tends to creep downhill (a process known as soliflu tion) and round off the uneven landscape. Solifluction is a slow process, but over the centuries it is able to move great quantities of soil. There is a delicate balance between the forces of frost action and those of re-vegetation. Because of this the Tundra is one of the most fragile ecosystems that a back-packer will experience.

In this land of short summers and bitter winters only a few animals have been able to survive. The comical pika with its shrill whistle can be seen on warm summer days busily gathering the grasses which will be its larder through the winter. The burrows of this industrious harvester can often be spotted by a pile of freshly cut grasses drying near its entrance. Another of the Tundra's residents is the sleek golden marmot, frequently seen sunning itself on the warm rocks of a boulder field. The ptarmigan, a bold, plump member of the grouse family, meets the changing seasons with a protective camouflage which changes from white in the winter to brown in the summer.

One of the most active of the Tundra's animals is the pocket gopher. It feeds on plant material all winter where the snow and soil meet. In the spring its twisting burrows can be seen as a core of hardpacked soil lying on the surface. Although the pocket gopher is responsible for eroding large quantities of the Tundra's precious soil, it performs a valuable service by plowing, fertilizing, and aerating it. Other Tundra animals include the water-pipet, rosy finch, violet-green swallow, weasel, red fox, mountain sheep, and snowshoe hare.

5. ANIMALS

The wildlife of the Maroon Bells-Snowmass Wilderness has been retreating from man since the first miners moved into the Crystal Valley in the 1880's. Since then the pressure has increased with sportsmen killing more deer and elk in the national forests and the predator control program initiated by the sheep and cattle industries. The grizzly bear, timber wolf, lynx, wolverine, and black-footed ferret are all extinct in the area, and the black bear, puma, bobcat, coyote and eagle are nearly extinct. If you see any of

these endangered species, please inform the OUTWARD BOUND School.

A classic example of the steady pressure on wildlife populations can be seen today in the depreciation of the elk herd. The Marble area, with its many large green valleys, is a critical calving area for the elk of the Maroon Bells-Snowmass Wilderness Area. They spend the winter in the lower valleys (Lost Trail Creek, Conundrum Creek, Rustler's Gulch) and head for alpine meadows as the snow recedes. However, as agricultural crops and fences invade the lower valleys, and highways intersect their instinctual migration routes, the number of elk in the area is dwindling. More recently the construction of the Marble Ski Area in the calving area (described later) and the invasion of trail-bikes and snowmobiles during calving time has threatened the existence of the entire herd. Elk, like most large animals, are not readily adaptable to change and might become victims of man's "progress."

Common Wildlife

1. Elk (wapiti) - height 4 to 5 feet, antlers 4 to 5 feet across, males weigh between 700 and 1,000 pounds. Chestnut brown with white rump patch. Habitat - open forests in summer, mountain valleys in winter. Often seen in groups of 25 or more. Feed on grasses, herbs, twigs, and bark.

2. Mule deer (blacktail) - height 3 to 3½ feet, antlers 40 inches across, males weigh 125 to 300 pounds. Vary from reddish to gray with white rump patch, tail black. Feed on grass, shrubs, and twigs. Seen singly or in small groups.

3. Bighorn Sheep - height 2½ to 3½ feet, weighs 125 to 175 pounds. Males have massive coiled horns. Brown to grayish with white rump patch. Habitat - high mountain slopes with sparse trees and rugged terrain (Capitol and East Maroon Peak). Seen in groups.

4. Puma (mountain lion) - 4 feet long, 2½ feet high, long tail, weighs 80 to 200 pounds. Tawny to grayish with white belly and black tip on tail. Habitat - rugged mountains and forests. Nocturnal, solitary, and secre-

tive. Eats deer, hares, and rodents.

5. Bobcat - 2 to 2½ feet long, weighs 15 to 35 pounds, stubby 5-inch tail. Rusty brown with spots. Habitat - low elevation, rocky or forest areas. Nocturnal, solitary, secretive. Eats birds, rodents.

6. Coyote - size of medium dog, 20 to 50 pounds. Gray to reddish with reddish legs and ears. Pointed nose and bushy tail. Eats almost anything. Nocturnal.

7. Red Fox - size of small dog, 10 to 15 pounds. Reddish yellow with darker bushy tail with white tip. Habitat - open forests. Active day and night. Makes underground dens. Eats rodents, birds, berries, and fruit.

8. Gray Fox - very small, 7 to 13 pounds. Gray back with red belly and legs, long bushy tail with black tip. Habitat - open forests and rocky areas. Nocturnal and very secretive. Omnivorous - rodents, birds, berries, and eggs.

9. Black Bear - 5 to 6 feet high, 200 to 500 pounds. Color varies from black and dark brown to cinnamon red and blonde. Usually nocturnal and solitary. Eats berries, nuts, insects, small mammals, honey, eggs, and garbage. Hibernates in dens during winter. Poor vision, good sense of smell. Not overly dangerous.

10. Porcupine - 25 to 30 inches long, 10 to 28 pounds. Heavy body, short legs. Clumsy and nearsighted. Covered with black and white quills, sometimes golden. Feeds on buds and twigs and inner bark. Often seen in trees.

11. Beaver - 30 to 40 inches long, 30 to 60 pounds. Rich brown fur, broad, bare, flat tail, webbed feet, large brown front teeth. Usually nocturnal. Prefers aspen, maple, alder, and willow. Feeds on bark and twigs. Builds conical dome in water or dens in stream bank. Stores cut limbs underwater. Makes dams which provide habitats for other animsla. Pond absent of algae if beaver present.

12. Marmot - 20 to 30 inches long, 5 to 10 pounds. Yellowish to brown with yellow belly. Day living, feeds on

grasses. Habitat - talus slopes and boulder fields up to 12,000 feet. Danger signal is a series of high-pitched whistles.

13. Marten - 20 to 26 inches long, 2 to 2½ pounds. Yellow brown to dark brown. Nocturnal, secretive. Habitat - up in trees of spruce/fir forests. Eats birds, insects, squirrels, fruit and nuts.

14. Mink - 17 to 24 inches long, 1 to 1½ pounds. Uniformly dark brown with white chin patch. Habitat - in or along streams or ponds. Feeds on small mammals, birds, eggs, frogs, crayfish, and fish.

15. Weasel (ermine) - 9 to 12 inches long, 3 to 6 ounces. Dark brown with white belly in summer, white in winter. Habitat - brushy wooded areas near water. Eats small mammals, birds, insects.

16. Golden-mantled Ground Squirrel - looks like large chipmunk, 6 to 10 inches long. Copper-colored with white stripe bordered by black. Habitat - open pine and spruce/fir forests. Feeds on seeds, nuts, fruit, insects, and eggs.

17. Chipmunk - 5 to 6 inches long. Color varies from chestnut brown to light tan with white stripe bordered by black. Carries tail upright when running.

18. Spruce Squirrel (chickaree) - 11 to 14 inches. Noisy tree squirrel which gives ratchet-like call. Varies from reddish to brown with lighter belly. Tail is bushy. Habitat - pine and spruce/fir forests. Eats almost anything, storing cones and nuts for winter (does not hibernate). Often leaves midden heap of cone chips. Nests in tree holes or nests built of twigs and leaves.

19. Pocket Gopher - 7 to 9 inches. Gray to brown. Has large front feet and incisors. Leaves trails of mounded dirt as the snow melts. Habitat - alpine meadows and open forests. Feeds on roots and tubers as well as surface vegetation.

20. Woodrat (pack rat) - 12 to 16 inches. Pale to dark gray,

long bushy tail. Accumulates sticks, bones, and other material among rocks, under logs, in old cabins, etc. Habitat - high rocky areas and forests. Eats grass, twigs, and green plants.

21. Pika (cony) - 6 to 8 inches long, 4 to 6 ounces. Gray to brown, no tail, round ears. Stores grasses for winter, often leaving them on rocks of boulder field to dry. Gives series of short squeaks from down in rocks. Lives in colonies. Does not hibernate.

22. Ptarmigan - plump, grouse-size bird above timberline. Brown in summer, white in winter. Unwary in the wild, it runs rather than flying. Makes a hen-like call, particularly in evenings. Eats dwarf willow and alpine fir needles.

23. Blue Grouse - male has bluish body with varied colored wings and head, female is mottled brown. The male produces a booming sound from inflated purple neck sacks during mating season. Live in aspen groves and mountain thickets.

24. Clark's Nutcracker - common in conifer forests around timberline. Light gray, jay-like bird with black wings and tail, white patches under wings. Has a crow-like call. Has little fear of humans.

25. Rosy Finch - a medium-sized reddish finch which lives near timberline. Frequently seen above timberline. Has both low and high chirping calls.

6. HISTORICAL IMPACT OF MAN

A. <u>The Ute Indians</u>

In an area as ecologically varied as the Maroon Bells Wilderness it should be no surprise that human history was equally colorful and interesting. Through nearly four centuries of recorded history there have been several waves of people inhabiting the area, each bent on exploiting the natural resources for their own livelihood. The first known inhabitants, of course, were the Indians. Known as the Utes, part of the Shoshone language group, the mountain Indians of central Colorado were a peaceful

isolated people at a level of sophistication just above the Stone Age. They gathered roots and berries and hunted for small game (all the way down to grasshoppers and mice). The Utes were a nomadic people, seeking their livelihood in the protection of deep valleys like the Crystal River and Snowmass Creek. In fall they left the high country and moved down into the open, sheltered meadows of the Uncompahgre and Gunnison Rivers. For the most part their lifestyle was harmonious with nature. They claimed no land in individual ownership, and all shared equally in the bounty of the land. If large game was killed, it was jerked and smoked and shared by many families for winter provisions. In bad years winter sometimes forced them to compete with the elk for the inner bark of aspens.

Things began changing for the Utes, however, when the Spanish introduced the horse. Trading animal skins for horses, the Utes became excellent horsemen within a few generations. The strength of the horse allowed them to penetrate deeper into the high mountains for big game, and further out onto the plains to battle their neighbors, the Cheyennes. As their range expanded, so did their taste for venison and antelope. The horse allowed them to use the burn-and-kill method of hunting more effectively. Vast hills and prairies were burned over so that armed horsemen waiting in ambush could kill fleeing game. In this practice seem the seeds of greed later brought to fruit by generations to come.

The Utes lived peacefully beside the incoming white settlers for many years. They even shopped in Denver stores and settled down in nearby towns. However, the Anglo-European settlers were rarely fair in their dealings with the Utes. Many treaties were broken by the United States government and gold-seekers in their relentless push westward. The Utes watched nervously as the white settlers drove out first the Cheyennes, then the Arapahoes, Kiowa, Jicarilla, and Comanche, and finally began eyeing the Ute lands. Although the Utes had been promised the Elk Range and all of the land west of the Continental Divide "as long as the rivers ran and grasses grew," the Indians were molested and removed as fast as gold and silver were discovered.

In 1878 Nathan Meeker, a poet, journalist and zealot, was sent to the White River Agency to "elevate and enlighten

the savages." Unfortunately for Meeker and his family, his sense of Christian zeal and Manifest Destiny ran headlong into the Indians' traditional values. When he seized a Ute pony racing track and forced the Indians to grow corn on it, they rose up against him, and the rest is history. The ensuing battle cry, "The Utes must go," must be one of the blackest marks in Colorado history.

Though a remnant band of Utes living in the Crystal River Valley still went to Glenwood Springs to hunt and bathe in the hot springs in the late 1870's (seeing electricity come to Glenwood), their era was over. In 1881 they were finally removed from their twelve-million-acre reserve in Colorado to a hot, dusty camp in Utah. Chief Colorow was moved with 1,458 braves, squaws, and children and their ten thousand sheep and eight thousand ponies. In their crowded and inadequate facilities in Utah, these once proud mountain people were decimated by smallpox, diptheria, measles, syphillis, and alcoholism.

In 1943 the confederated Ute tribes sued the United States government for compensation of their stolen lands, a total of 650,000 acres or 1/12th of Colorado. Included in this valuable land were coal deposits, oil domes, mineral deposits, vast forests and grazing lands. The tribe received $32 million, or the equivalent of $4,135 per living adult.

B. The Pioneers

The Indian cultures of Colorado, with their hunting and gathering societies, lived in a dynamic equilibrium with their environment. Their minimal impact and small numbers did not exceed nature's resilience. However, the coming of the white man brought new problems.

More than any other, one practice introduced by the pioneers would prove to be more destructive of the wilderness than the Indian could have imagined - trade. The earliest pioneers were attracted to Indian territory to exploit beaver pelts, buffalo meat and valuable ores. Later, timber, fertile soil, and grazing lands would lure even more pioneers. Unlike the Indian's subsistence living, the forest industries of the pioneer worked at the expense of nature rather than with nature. The sudden and unaccustomed drain

on the resources of the wilderness was responsible for upsetting intricate ecological balances which had evolved over millions of years. Pioneers had always lived from the bounty of the land, and it didn't seem wasteful to them to use nature's resources in whatever way possible. Sometimes they would kill antelope, deer, bear, or elk just for their hindquarters or a day's meal. To supply the needs of this hungrily growing territory, market hunters would kill game by the wagonloads, at a time when fish, game, and fowl sold for as little as two cents per pound over the retailer's counter. In the early days such competition incited Indian uprisings and reprisal attacks, but over-hunting continued until both game and Indians were scarce.

Eventually the West was won and the unique bunch grasses of the prairies were replaced by foreign annuals; the grassland herbivore changed from buffalo to cattle; open range gave way to fenced-in ranches; artificial irrigation replaced streams; and most natural predators were exterminated.

The same fate awaited the mountainous West. In their rush to settle the mountains, the pioneers first homesteaded the rich meadows and year-round streams. Control of a stream or waterhole gave the owner control of large stretches of land. Rapidly the choice bottomlands were plowed and fenced, cutting off the annual migration of big game and relegating them to less desirable foothills and high meadows. It wasn't long before man was the dominant species.

The Maroon Bells-Snowmass Wilderness Area, representative of most of the Rockies, had a particularly colorful and telling past. The first Europeans to enter western Colorado were members of Don Juan Rivera's party in 1765. His expedition explored the unknown lands north of New Mexico to the Uncompahgre River. The next Europeans were Fathers Escalante and Dominguez who charted an overland route from Santa Fe to Monterey in 1776. They were guided by the Utes up the Gunnison River right past the mouth of the Crystal River Valley. After another long period of rest the Crystal River was explored in the 1830's by American beaver trappers. The trappers traded their pelts for cash and provisions at Fort Uncompahgre, which was rapidly becoming a center for Indian trade. By the 1840's only a decade later, Jacob Astor's fur traders entered the Maroon Bells area and exhausted all remaining pelts.

The first real exploring expedition into the area was made in 1860 when Richard Sopris, later mayor of Denver, led fourteen companions into the Crystal River Valley looking for valuable ores. In 1874 the Utes discovered their mines, burned their buildings, and drove them out. In 1874 Dr. F. V. Hayden, receiving immunity from Chief Colorow, led a thorough geologic survey through the area, producing maps which have served to the present day. It was on this expedition that one of the men discovered the tremendous deposits of marble in Whitehouse Mountain.

C. Mining Towns

With the discovery of valuable minerals in the Elk Range between 1870 and 1880, boom towns began popping up throughout the area. In 1872 silver, copper, lead, galena, and zinc were discovered in the upper Crystal River Valley and the town of Schofield grew up overnight. For seven years prospectors slipped in and out of the area under the nervous and watchful eyes of the Utes. It wasn't until 1879, when Chief Ouray had quieted the Utes that settlers really swarmed the area. At its peak Schofield had about sixty shanty houses, several saloons, a store, a hotel, and a post office. At the base of Schofield Pass it served as a stopover for the few stages and burro trains that dared the rugged pass. One of its most colorful residents was Old Lady Jack, the niece of famed Indian scout, Jim Bridger. She is said to have been so finicky about cleanliness that she washed and hung out to dry her thirty-odd cats. General Grant is supposed to have ridden a white mule up to her porch in Schofield in 1880 when campaigning for the presidency. When shown Devil's Punchbowl, then called "Sonofabitch Canyon," he is said to have quipped that it looked more like "Shultz Canyon" after his presidential opponent. Within a decade the cost of transportation began exceeding the value of ore, forcing the whole town of Schofield to move five miles down the treacherous valley to Crystal.

In its fortress of high rocky cliffs Crystal feels more like a mythical lost kingdom. Now a ghost town with ten buildings, Crystal once boasted of 650 people. In its heyday, it had many solid homes, several general stores, a school house (which is still standing), several saloons, a pool hall and two newspapers. Being a rugged and isolated mountain town Crystal attracted few women. Stories abound

in the Crystal Valley of Friday evening footraces to Marble, five miles away, to be first in line at gay saloons where girls in founcy skirts served the bar. By 1885 seven good mines were producing ore, and one, the Sheep Mountain Tunnel, penetrated a half mile into the mountain. Crystal's biggest enemy was its location. All ore had to be transported by mule train over the murderous Schofield Pass to Gothic, or down the winding Crystal River. Snows and avalanches kept the town totally isolated for most of the winter. Because of this, and exhausted minerals, Crystal too fell. In 1893 the demonetization of silver closed down the Black Queen, Lead King, Black Eagle and other colorful mines.

Gothic, being more accessible to Crested Butte, soon grew to huge proportions. In its zenith, with a population of 8,000, Gothic earned a reputation as the wildest and rowdiest of the mining towns, complete with gambling halls, saloons and shady ladies. Gold was first discovered in 1879 and within a week a hundred tents had sprung up. Within four months it had 170 shanty buildings including a hotel, butcher shop, three general stores, and two sawmills. Within a year it was the wealthiest town in Gunnison County. Snowbound for most of the year, the citizens of Gothic kept their spirits up with great parties, horse races and gambling. Today Gothic is a far quieter place. It has been turned into the Rocky Mountain Biological Research Laboratory which studies plant and animal life of the high mountains.

The town of Marble has proven to be the most persistent of the boom towns. Its first permanent residents were John Mobley, a former Indian scout, his wife and two daughters. They came over Schofield Pass in 1880 looking for silver and settled on Beaver Lake with only fifty pounds of flour, one bar of soap, and a box of matches. Within twenty years Marble grew to respectable proportions. By the turn of the century it claimed five general stores, a drug store, dry goods store, two hotels, two schools, two pool halls, a movie house, six saloons, and two active smelters. The smelters processed ten tons of ore per day which was brought over Schofield Pass on the backs of a hundred mules. As the town grew Henry Thode employed eighteen lumberjacks in his mills in town and up Lost Trail Creek (where his steam "donkey" engine can still be seen.) When all of the available timber had been cut, an overflow of seven hundred people

were forced to live in tents.

Originally settled by silver miners, Marble's real boom proved to be the mountain of marble two miles to the east which contains the world's hardest and whitest marble. The first stone was taken out by wagon over the long road to Carbondale in the summer and by sled in the winter. A considerable amount was removed in this way before the Crystal River and San Juan Railroad finally reached Marble in 1906. As the quarries prospered Yule marble was sent all over the world. Over a hundred buildings from New York to San Francisco were boasting of America's own carrara marble. Between 1912 and 1916 Marble hosted 1,400 residents. However, in 1917, with the need for marble cut by World War I, Marble collapsed. In a single year 1,300 people sadly left their mountain hideaway.

A couple years later Marble got a short reprieve when the Yule Marble Company was granted a million-dollar contract to build the Lincoln Memorial. The job was so large that it required a completely new finishing mill and special equipment. During the two years of work the quarries hired a thousand men. The columns for the Memorial, which were made of eleven stone drums (some of which can still be seen around Marble), cost $15,000 apiece. Shipping the finished blocks to the nation's capitol required forty freight trains of fifteen cars each. The marble was removed in large blocks by placing charges of gunpowder in a border of drilled holes. Later large saws loosened the blocks and they were swung out on a derrick to the waiting cars of an electric tram. They were then taken to the planing mill in Marble where gang saws cut them into the desired size.

A second short-lived boom came in 1931 when the quarries got their last contract - the Tomb of the Unknown Soldier for Arlington Cemetery. It was the largest single block of marble ever quarried. It weighs 56 tons and is flawless. With prohibitive transportation costs and a declining market for marble, the company dissolved and Marble faded into the pages of history. The final death knell was rung for the quarries in 1941 and 1945 when two tremendous mud floods coursed down Carbonate Creek and destroyed the planing mill and half the town. The debris from these floods can still be seen throughout town.

Crystal Valley Chronology

Year	Marble's Population	
1870		Ute Indians were being forced out.
1872		Town of Schofield founded on Ute lands.
1874		Dr. John Parsons discovered marble deposits.
1879		Town of Gothic founded on Ute lands.
1880	4	John Mobley and family settled on Beaver Lake.
1894	200	Crude quarries operating east of Marble.
1897	200	Two smelters opened in Marble.
1901	150	Marble elected first sheriff and built jail (which still stands).
1905	150	Colorado Yule Marble Company founded.
1906	150	Electricity came to Marble. A 735-horse-power generator was built to operate the tram. The finishing mill was completed and was largest in the world.
1907	150	Crystal River and San Juan Railroad completed linking Marble with Carbondale.
1909	700	Lots jumped in value from $35 to $250.
1912-1917	1400	Five-year peak of Marble's population and prosperity.
1914	1400	Lincoln Memorial contract.
1918	100	World War I breaks out and Carbonate Creek floods. 1300 people leave.
1931	500	Tomb of the Unknown Soldier contract.
1939		Marble becomes favorite vacation area for skiers from Glenwood, Carbondale, and Redstone.
1941		Disastrous flash flood on Carbonate Creek destroys planing mill and town.
1942		Railroad dismantled and quarries shut.
1945		Second large flood destroys much of town.
1953		Basic Chemical Company attempts to market marble for fertilizer.
1957		Crystal River Enterprises builds airstrip.
1958		Completion of road between Crested Butte-Gothic - Crystal - Marble.
1964		Oberlander Corporation buys 1500 acres around Marble for ski resort and summer community.
1962	5	Colorado OUTWARD BOUND School moves to Marble.

D. The Environmental Impact of the Mining Towns

The environmental impact of the various industries which grew up with the towns along the Crystal River is hard to assess. The first white residents were most interested in pelts and skins and soon depleted the number of beaver, otter, mink, bear and other mammals. Following the trappers came the miners. Acids seeping out of the tailings of silver and gold mines soon polluted many streams, affecting trout and other organisms. With the mining towns came more permanent farms and ranches. The land was fenced and sometimes burned over for grazing. Logging on a large scale was necessary to provide firewood and lumber for the growing populace. Forest fires and roads reached further into the wilderness, allowing cattle and sheep into the fragile high meadows. Within thirty years the landscape was thoroughly altered.

Between 1880 and 1910 the wildlife of the Maroon Bells area had nearly disappeared. In their short-lived prime, Marble and Crystal had hunting contests to see which town could kill the most game in one day or one week. At that time the hunting and fishing limits allowed no more than fifty pounds of fish to be caught in one day and no more than twenty-five ducks or geese to be taken in a day. No limit was set on deer, elk or bear; and they were nearly eliminated by the turn of the century.

7. THE CURRENT DAY

A. The Creation of the Maroon Bells-Snowmass Wilderness Area

By the late 1880's and 1890's a few sensitive citizens of Colorado began realizing the extent of the environmental degradation occurring in their state. They slowly began rallying and in 1891 were successful in urging President Harrison to establish the White River National Forest in central Colorado. Containing two million acres in two blocks, this new national forest was set aside for protection under the U. S. Forest Service. The forest was named for the White River which has its headwaters high within its boundaries.

The Forest Service, under the Department of Agriculture, maintains one hundred and fifty-four national forests, in-

cluding 20 per cent of the state of Colorado, following a philosophy of multiple use and limited exploitation of resources. To the Forest Service this means that "renewable forest resources - water, timber, forage, wildlife, and recreation - are managed under the principles of multiple use and sustained yield. Multiple use means that resource management is coordinated so that areas of land produce a combination of values that best serve the American people. Sustained yield means that resources are managed at a level of supply as high as can be sustained without harming the land's ability to produce." In theory this philosophy is sound; however, as years have passed, vast areas of our national forests have been clear-cut, dammed, over-grazed, over-hunted and skied to death. In response to this plunder, concerned citizens and agencies began suggesting that certain wild areas be given even greater protection. For this reason in 1964 the Wilderness Act was signed into law. It set aside small islands of truly wild land within the existing national forests and parks, preserving them in their wilderness state forever. The Wilderness Act was a bold and necessary step, though it now appears that many wilderness areas are too small to really preserve wilderness quality, while others are being harmed by development around their border. Furthermore, there are loopholes within the language of the act which invite large-scale abuse. The act says, "...in contrast with those areas where man and his own works dominate the landscape, a wilderness area is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor and does not remain." However, grazing of livestock and water projects are permitted in the wilderness as long as no roads are built, and mining claims are allowed until 1983 (for which permission to build roads can be obtained from the Forest Service).

The Maroon Bells-Snowmass Wilderness Area was created by the Wilderness Act and contains 71,000 acres, or one-fourth of all official wilderness in Colorado. Within its borders are many peaks over 14,000 feet high, including the magnificent Maroon Bells. The official boundary of the wilderness area cuts an arbitrary enclave out of the center of a much larger wilderness, one that could be as large as 150,000 acres and include another half dozen of Colorado's famed peaks. There is currently a movement in the direction of expanding the official boundaries to include more of this priceless

land. Within a few years the relatively small Maroon Bells-Snowmass Wilderness has attracted a lot of attention and has become one of the most heavily used wilderness areas in the United States. Since 1964 visitation has soared by nearly 400 per cent. Many of these visitors come with organized groups such as the Sierra Club, scout groups, church retreats, climbing clubs, and horse packers. In addition, several schools utilize the area for study and research, including OUTWARD BOUND, Aspen Public School District, and Rocky Mountain Biological Research Laboratory. Private parties use the wilderness area for fishing, horseback riding, backpacking, dogsledding, mountain climbing, skiing, and photography. Concentrated into a small area, such heavy use is undermining the very purpose for which the wilderness area was created. In spite of a rapidly evolving awareness in American society that man has and is still irreversibly altering the environment, the prevailing mentality remains of man as exploiter rather than silent observer of the delicate outdoors. Many examples could be cited, but some of the more blatant ones (sheep grazing, poisoning, and ski area expansion) should be informative.

B. Sheep Grazing

Sheep grazing is typical of many of the problems of resource management in wild country. It began at a time when the forests seemed endless and little was known of the complexities of forest ecology. However, as the sheep multiplied, so did their impact. Soon whole areas were badly over-grazed by what some westerners call mountain maggots. Mountaineers are naturally not too happy with an animal which fouls water with amoebic dysentery and liver flukes, carries ticks which cause fever, and brings swarms of biting flies into the wilderness.

The sheep industry began in the Maroon Bells over sixty years ago and continues every summer. Sheep ranchers from a wide area (as far as Utah) truck their herds to the wilderness and graze them in the high meadows as the snow melts. Controlled by the Forest Service, the ranchers pay fifty cents per month for each adult sheep grazed. In recent years the Forest Service has simply taken the shepherds' words for the size of their flocks, leading some conservationists to believe that there might be two or three times more sheep in our wilderness than the carrying capacity permits. Another

common abuse is grazing ewes with two lambs. Since lambs are not taxed, sheep ranchers often double up the number of lambs per ewe, saving their own private pastures for other animals.

Sheep are particularly hard on mountain meadows. Unlike cattle and deer, sheep crop plants right down to the ground and kill them. If allowed to remain in one area for a day or more than can totally denude a hill, baring the soil to spring and summer rains. Before his death in 1972, Charlie Orlosky was Marble's oldest resident. He has become a legend around the Crystal River Valley because of his keen observations and deep love of the wilderness. Although most of the ranchers were his friends, he had few kind words for their sheep. "There's another thing you've got to chalk up against the sheepmen," Charlie said. "I've been in this country all my life. When I was a boy the vegetation in these meadows was over my head, and all these slides on the hills that show bare rock today were covered with grass. Meadow Mountain was called that because there used to be a lot of meadows up there. Now you can hardly find any grass it's so over-grazed."

In 1941 there was a massive mudslide which covered the town of Marble. It destroyed the marble-planing mill and half the town. Today you can still see the remains of the town's bell tower and bandstand standing mutely in a bed of boulders which cover Marble's central square. This flood was the last straw for those few people who clung to Marble's fragile past. There isn't much doubt in most people's minds that over-grazing in Carbonate Creek above town started the slides. The Basque and Mexican shepherds didn't have to stay and clean up - they just moved their flocks up to higher pastures.

Over-grazing causes other serious problems, too, including siltation and increased runoff. Talking to a newcomer in the Crystal Valley one spring, Charlie said, "Did you see the Crystal River on your way up here? They would never call it the Crystal River if they named it today, because it's as muddy as the Mississippi every spring. Of course it will clear up later, but then watch the water level drop off. There is no grass cover on these hills any more to hold back the ground water and feed the streams through the summer."

The ecology of alpine areas is quite similar to that of the norther tundra; both are extremely fragile, delicately balanced, and require a long period of recovery if disturbed. Scientists such as those at the Rocky Mountain Biological Research Laboratory at Gothic are just now beginning to understand the intricacies of the mountain environment as fast as it is molested by man's use. Now it is almost impossible to tell what the original plant cover was, because so many important plants have been grazed away. Others, resistant to grazing, poisonous, or unpalatable, are left behind. Deer, elk, and other animals that compete with sheep for grasses are being displaced. A recent report of the Public Land Law Review states that the majority of sheepmen grazing animals on public land are just breaking even. One questions if this artificially subsidized industry is worth the ecological havoc it wreaks.

C. Poisoning

But the sheep industry poses an even more disastrous and far-reaching threat known as predator control. It was the sheep ranchers who originally requested the federal government to exterminate all large carnivores, and - to a large degree - it is the same interests that are trying to continue the program today. In February, 1972, by executive order, the Department of the Interior halted its program of predator control on public lands. But today the Colorado Woolgrowers Association is supporting a renewed campaign of massive extermination of predators in wild areas. In response to this pressure Colorado has had a full-time team of employees, under the Fish and Wildlife Service of the Department of the Interior, whose job it is to kill "unwanted" animals. In cities they concentrate on pigeons, skunks, and raccoons, and in wild country on coyotes, foxes, and bobcats. Their techniques vary depending on the animal and currently include steel traps, den-hunting, shooting from airplanes and, worst of all, poisoning. Strychnine is often dropped in suet balls from the air to kill coyotes and bobcats. Unfortunately, as any schoolchild could figure out, many other animals eat the suet. Martens, weasels, badgers, mountain lions, foxes, skunks, rabbits, porcupines, squirrels, and many birds are also killed in this cruel and senseless way. Another common poison, called "coyote getters," are simple guns loaded with cyanide which are placed in the ground near coyote paths. The tragedy of these devices is that many

dogs, family pets, etc., are attracted to the bait and killed. Red warning signs telling of the presence of coyote getters can be found in the vicinity of Rustlers Gulch.

As though strychnine and cyanide weren't bad enough, a new and much more lethal poison has been added to the wilderness arsenal. It is called 1080, or sodium flouroacetate, and has been used to kill bears and canines (red wolves, foxes, and coyotes) and also many types of rodents. An ounce or two of 1080 bait is enough to kill most canines and, of course, it doesn't stop there. Weasels, martens, eagles, vultures, magpies, Clark's nutcrackers, and many other animals are killed by 1080; and it works its way up through the food chain.

After resigning from the Fish and Wildlife Service to protest the use of poisons, Charlie Orlosky said, "I figured that one hundred pounds of poisoned grain for rodents is enough to kill twenty thousand dogs or coyotes by secondary action. When you consider the tons of bait being used each year - I believe it runs over 150,000 pounds - it makes you wonder how we have any rodent-eating animals left. The fact is we don't have many; and gophers, mice, and ground squirrels are taking over." Charlie quit when they tried to force him to use 1080. He was shocked in 1953 and 1964 to find poisoned animals in the drinking water supply for the town of Marble.

"A poison bait is a major environmental change," says biologist Dr. Alfred Etter. "It creates a kind of maelstorm or vortex toward which wildlife continually drifts, attracted not only by the bait, but by the dying and dead victims and by the absence of population pressure." (Defenders of Wildlife News, January, 1969) So why does debate about this poisoning continue? Like so many strongholds of resistance in the face of evidence, the sheepmen are a strong lobbying force. The Colorado Woolgrowers Association and others might be able to effectively stop legislation which would ban predator control. They claim that sheepmen suffer great losses due to predators. Each year sheep ranchers who have allotments of National Forest land for grazing must make a report which includes information on death losses due to predators, poisonous plants, disease, freezing, falls and other causes. For income tax reasons though most ranchers lump

all their losses together under the predator column. Thus, the wilderness pays a mighty sum for the profit of a few. Early this year the woolgrowers lobby will seek to reinstate the extensive poisoning on public lands and reverse the Environmental Protection Agency's ban.

D. Ski Area Expansion

The Multiple Use Policy of the Forest Service allows four main economic enterprises to exploit our national forests - mining, lumbering, livestock grazing, and ski area development. The effects of sheep grazing in the Maroon Bells-Snowmass Wilderness are clear, but the greatest looming threat to this wilderness is the further development of skiing communities. The Maroon Bells are located roughly in the center of a triangle, twenty miles on a side, formed by the towns of Aspen, Crested Butte, and Marble. For several years large land developers have been quietly planning a skiing mecca connecting these three towns and creating the world's largest skiing complex. Since 1946 four ski resorts have been built around Aspen. They include Aspen Mountain, Buttermilk, Aspen Highlands, and Snowmass-at-Aspen (which will soon be the largest single ski resort in the world with a capacity of 27,000 people). Developers are presently requesting additional national forest land for a fifth resort on Haystack Mountain. During the same years the impressive majesty of Crested Butte has been scarred by several new ski runs. Together these developments have sealed off the wilderness on the north, east, and south. The final barrier is now being built in Marble to the west.

The master planner for the new Marble ski area is the Continental West Realty Company which is presently selling four other western communities. It has zoned 90 per cent of the private land around Marble and has been selling acres of this pristine mountain real estate for $20,000 to $50,000. What lies behind this kind of speculative bonanza? Many people believe that the Continental West Realty Company has been quietly assured that it will receive four thousand acres of public land for development of ski lifts.

The resort planned for Marble will have fourteen chair lifts, a nine-hole gold course, a convention center, an airstrip, and housing facilities for up to 23,000 people. All of this in a near ghost town that presently has twenty-two

full-time residents! It is being advertised as an all-weather, tennis, skiing, condominium city for young, wealthy swingers.

The last couple of years have seen feverish building activity around Marble. The access road and double chair-lift have already been built, and construction has started on ski and tennis facilities. They have moved so fast in fact that in May, 1971, the Marble Ski Corporation cleared the forest and extended its chairlift four hundred feet up into public land without permission. The Forest Service took action, requiring them to reseed the area and build appropriate drainage structures. Since that time Regional Forester William Lucas and Forest Supervisor Tom Evans have disapproved several applications for further development of the ski area onto national forest land. This action has probably been prompted by the heroic efforts of a small group of Aspenites known as the Wilderness Workshop who have repeatedly called for the preservation and expansion of the Wilderness Area.

The real bombshell was dropped in the summer of 1972 when John Rold, the Colorado State Geologist, released a report describing the highly unstable slopes on which the entire community is being built. Since 1969 several landslides have dumped eight feet of new gravel and silt into a valley where several of the condominiums were to be built. Within two days headlines in the Denver Post read, "A multi-million dollar ski resort planned on Colorado's western slope is being built on ground subject to almost annual massive flooding and landslides state officials have discovered." The Colorado Land Use Commission considered using its emergency powers for the first time to "retard" the progress of the development. Although no final decision has been reached about opening more public land to these developers, this action might have accidentally saved the last remaining buffer zone so necessary for the health of the Maroon Bells-Snowmass Wilderness Area.

If this area is developed, it will almost surely mean the end of the large herds of elk living in the Maroon Bells. There are nearly one-thousand elk which spend the winter and bear calves in the Marble area before heading for the high mountains. To seal them off would end their annual migration which has occurred for tens of thousands of years.

E. Future Problems

With the population of Colorado growing even faster than that of India, environmental problems are looming as a real threat. As Colorado industrializes, the pressures placed on wild areas are growing rapidly. At the same time Colorado is becoming the playground of the nation, and the Maroon Bells-Snowmass Wilderness Area seems to be the heart of it. When Interstate 70 is complete, travel time from Denver will be cut by an hour, eliminating Loveland Pass and the Continental Divide. The road to Redstone is now being paved, making a direct link out to Glenwood Springs and I-70.

At the same time the state is preparing for the exploitation of massive deposits of coal and oil shale (28 per cent of the state is underlain by coal, and 1,400 square miles by oil shale). Because of the depth of these deposits strip mining is almost inevitable. The terrifying environmental impact of this type of mining is hard to imagine. However, one of the first effects will be the requirement of tremendous quantities of water. To accomplish this most of the natural waterways of the mountains will be altered and rerouted. The Army Corps of Engineers have discussed placing a dam on the Crystal River at Placita below Marble. This dam, called the West Divide Project, would route water through a twenty-mile tunnel and take the Crystal River over to the proposed oil shale fields.

Any future development of this kind will have a considerable impact on water quality, big game, fish, and plants in the area. The increased population pressure on the natural habitat, increased noise pollution and air and water pollution will all serve to decrease the nesting and calving territories, forage and species population until even more animals become extinct or endangered. In order to protect the wilderness quality within the Maroon Bells-Snowmass Wilderness, the boundaries should be expanded and natural areas protected. Without prompt action the Maroon Bells-Snowmass area will continue to deteriorate until it bears little resemblance to the wilderness that pioneers settled only ninety years ago.

8. OUTWARD BOUND'S USE OF THE WILDERNESS AREA: A WILDERNESS CODE FOR OUTWARD BOUND

The wilderness areas that OUTWARD BOUND School uses are becoming increasingly more popular. Some areas, like the Maroon Belle-Snowmass Wilderness, have had an increase in visitor use as much as 400 per cent. Backpacking is something that a great number of new people are trying. Increasingly, wilderness campsites, even when free of obvious litter, are getting the beaten-out look of roadside campgrounds. The fragile high country is being ground under too many feet. Dust, charcoal, blackened stones and dirty fireplaces are accumulating. The solution to these problems depends on us. If we learn good habits in OUTWARD BOUND we will spread the "good word" to others. We must develop a habit of causing as little impact on the terrain as possible, leaving no traces of our presence. Many good mountaineers today are learning the lessons of the Indians and pioneers when traveling through enemy territory and covering their tracks completely. The code of the back-country living requires leaving campsites so natural that no one can know you were there. Your value system will be reflected by your adherence to the following principles:

A. Choosing a Trail
- wherever possible, avoid delicate terrain such as tundra and meadow communities. These areas take an inordinately long time to heal.
- stick to established trails and do not create further impact and erosion by shortcutting the switchbacks.
- on first ascents and new trails leave no markers or signs. You enjoyed being first; allow others the same privilege.
- avoid the crowds. Choose ridgetops and high country, camping in high basins with no lakes. People rarely visit them.

B. Locating a Campsite
- wherever possible, use an existing site, minimizing human impact on the area.
- choose a "hard" site with sand or duff soils (under trees) rather than the fragile sod of meadows, lakes and streamsides. Don't camp next to lakes; too many people already do, destroying fragile plant communities and cutting animals off from their supply of water.

- for a warm morning's awakening, choose a site that gets morning sun. This will make for a warm breakfast and dry equipment.
- camp above low ravines and streams as wet air hangs in low places and cold dew will condense on your tent and sleeping bag.
- rocks absorb and radiate the sun's heat well into the night, making a warmer campsite.
- face your tent away from the direction of the wind. Wind will blow down a valley all night and from a lake onto land, reversing by day.
- do not do any engineering on your site - no trenching, brush removal, cutting boughs, etc.

C. Making a Campfire

- the first rule to remember is to use as little firewood as possible and only downed, dead wood; in timberline areas particularly wood is being burned faster than it is produced. Wood is a precious resource; use it sparingly. Dead wood is necessary for adding decomposed organic material to fertile soil, and many organisms depend on it for their living.
- use a portable cooking stove for all meals (especially around timberline) and a small fire for warming the whole group only after the sun goes down.
- choose a fire circle that has already been used. Some areas have far more fireplaces than people could ever use. Each blackened circle has sterilized the soil of all its soil-building organisms and plants.
- in building a fire, clear the area of all grass, leaves, and other flammable material until bare soil appears. If the soil is rich in humus, remove the top four or five inches. Forest duff and roots can burn underground for great distances.
- dig a shallow trench and ring it with two to four rocks as a wind screen. Do not use an overhanging rock wall as it will crack and be scarred forever.
- when leaving be sure your fire is dead out. Roll the rocks away and pour water on the whole area and stir. Be sure there are no smoldering roots, or humus.
- if the camp is likely to be re-used, leave the rocks where they can be used again (lots of critters live under permanent rocks); otherwise, destroy all traces of your stay.

D. Water
- most people trust water in wilderness areas. If there is any doubt that the water might not be safe but be contaminated by human or livestock wastes or dead animals, use a Halazone tablet for each quart of water, or boil it for fifteen minutes. Dysentery, liver flukes, and hepatitis are water-borne diseases.
- do not use any soap in water for any purpose - dish-washing, handwashing, or bathing. Instead, wash in a pot well up on shore. Use only biodegradable soap. The phosphates and nitrates in detergent pollute mountain water and cause diarrhea.
- swim downstream of your camp.
- do not throw any garbage scraps into water. Mountain waters do not have the decomposers necessary to break down such scraps.

E. Human Wastes
- all human diseases can be transferred through our wastes. You might be carrying dormant germs without knowing it.
- carry one spade for every eight to ten people.
- locate a group privy at least 300 feet from any water body.
- dig a hole eight to ten inches deep (animals will dig it up if any shallower) and big enough for one day's use by the whole group.
- burn toilet paper in the whole rather than burying it.
- spread a layer of dirt over privy after each use to keep flies out (they carry germs to your food).
- when finished, replace the layer of sod and cover with a large rock or log.

F. Trash
- pick it up - pack it out!
- carry out all cans, glass, and foil. Do not bury them.
- burn all paper and burnable garbage.
- do not bury anything. Soft food scraps like coffee grounds, fruit and vegetable peelings should be spread thinly out of sight in areas like bushes and rock fields. An exception to this are orange peels, egg shells, and nut shells, which must be thoroughly burned.
- before leaving go through your fire pit and remove any aluminum foil and other non-biodegradable trash.
- double check your entire area for evidence of your stay.
- clean up as you go. Every trip out should be a clean-up trip. OUTWARD BOUND is dedicated to the principle of service. Be an example for wilderness manners.

APPENDIX I

How to Recognize the Common Trees

Conifers

Key:

- If needles are gathered together at base in clusters of two to five in a little sheath that often wears off after first year and cones with thick woody scales, see Pines, Nos. 1 - 3.
- If needles scattered singly over the twig, sharp-pointed, four-sided, leaving twig pocked and hanging cones with parchment-like scale, see Spruces, Nos. 4 & 5.
- If needles blunt, flat, leaving smooth, round scars when they fall off and cones erect and disintegrating, see Firs, Nos. 6 & 7.
- If cones are conspicuous, persistent, dangling, and have three-pronged tongues sticking out between scales, see Douglas Fir, No. 8.
- If needles reduced to green scales, about ½-inch long and cones reduced to small bluish berries, see Juniper, No. 9.

1. Timber Pine - needles in clusters of five, 1½ to 3 inches long and very flexible. Cones 3-10 inches long and not sharp. Bark scaly, dark brown to black. Grows 25 to 50 feet tall and 1 to 2 feet in diameter.
2. Ponderosa Pine - needles are in clusters of two or three, 5 to 10 inches long and form tufts near the ends of branches. Cones are oval and 3 to 6 inches long with sharp scales. Bark changes from dark brown to reddish-orange with broad scaly plates (like a jigsaw puzzle). Grows 150 to 180 feet tall and 3 to 4 feet in diameter.
3. Lodgepole Pine - needles in bundles of two are 1 to 3 inches long, stiff and dark green. Cones 1 to 2 inches long, prickly scales and remain closed and attached in thick stands of 75 to 80 feet tall after a fire.
4. Englemann Spruce - needles stiff, 1 to 1½ inches long, dark green. Cones are 1 to 2½, light chestnut brown, papery thin scales. Bark scaly, reddish to purplish. Grows 100 to 125 feet tall, 1 to 3 feet in diameter.
5. Blue Spruce - unlike Englemann, cones are over 3 inches long. Needles are stiff, 1 to 1½ inches long, stick out in all directions and are silvery blue. Bark dark gray. 80 to 100 feet tall, 1 to 2 feet in diameter. Grow near streams.

6. Alpine Fir - needles are flat and upturned, 1 to 2 inches long with silver lines on both sides. Cones are 2 to 4 inches, upright, smooth, purplish and disintegrate slowly with age. Bark is gray brown, scaly and furrowed. Tree grows 40 to 100 feet tall with spire-like crown, 1 to 2 feet in diameter except at timberline where it is stunted and twisted.
7. White Fir - needles are bluish green, upturned, flat. Cones are 3 to 5 inches, upright, olive-green to purplish and disintegrate with age. Heavily ridged, dark gray bark. Grows 125 to 150 feet tall, 2 to 4 feet in diameter. Occurs at lower elevations than Alpine Fir.
8. Douglas Fir - needles are 1 to 1½ inches long and stick out in all directions. Cones 3 to 4 inches long and have three-pointed papery bracts hanging out. Bark of young tree is smooth and gray with resin blisters, later thick and furrowed. Drooping branches; reaches 100 to 130 feet tall, 2 to 3 feet in diameter.
9. Rocky Mountain Juniper - needles reduced to scales on short branches. Cone is blue-gray and pea-sized. Grows up to 40 feet tall, 1 to 3 feet in diameter, with divided trunk. Bark gray to reddish and shreddy.

Deciduous Trees

1. Quaking Aspen - heart or delta-shaped leaves of yellow-green, turning yellow in fall. Bark white, turning gray with age, sometimes furrowed. Dangling catkin flowers.
2. Narrowleaf Cottonwood - leaves waxy and narrow like willow, 2 to 3 inches long. Bark yellow-green to brown and thickly furrowed. Grows 50 to 60 feet tall. Dangling catkins.
3. Box Elder - leaves compound, 3 to 5 on stalk and coarsely toothed above middle. Tree low and heavily branched, 25 to 40 feet high. Bears small yellow-green petals and double-winged seeds.
4. Rocky Mountain Maple - usually a shrub, but grows up to 20 feet high. Simple three-lobed leaves with toothed margin, 1 to 2 inches long. Reddish paired-wing seeds.
5. Western Chokecherry - shrub 3 to 15 feet high. Clustered white flowers and black berries. Alternate finely toothed leaves, 3 to 5 inches long. Bark, leaves, berries bitter.
6. Gambel Oak - shrub to small tree, often in dense thickets. Leaves are shiny, round-lobed. Seeds are acorns.
7. Willow - common along streams in marshy areas and snow fields. Narrow, shiny, sharp-pointed leaves. Shrub or tree to 25 feet.

APPENDIX II

Checklist of Common Wildflowers

1. aster
2. avalanche lily
3. balsam root
4. bistort
5. blackeyed susan
6. bluebells
7. blueberry
8. blue flax
9. buttercup
10. camas
11. candy tuft
12. chiming bells
13. cinquefoil
14. clover
15 columbine (blue, red)
16. corn lily
17. cow parsnip
18. dandelion
19. death camas
20. elephant grass
21. elk clover
22. false hellebore
23. firewood
24. forget-me-not
25. gentian (green)
26. geranium
27. globe flower
28. goldenrod
29. harebell
30. Indian paintbrush
31. king's crown
32. kinnikinnick
33. larkspur
24. lupine
35. mariposa lily
26. marsh marigold
37. monkey flower
38. monkshood
39. moss campion
40. mountain aven
41. mountain bluebell
42. mustard
43. orchid (calypso, bog)
44. Oregon grape
45. parry lousewort
46. parry primrose
47. parsley
48. pearly everlasting
49. penstemon
50. rose
51. salsify
52. scarlet gilia
53. sego lily
54. shooting star
55. sky pilot
56. Solomon seal
57. spring beauty
58. stone crop
59. strawberry
60. thistles
61. townsendia
62. vetch
63. violet
64. waterleaf
65. Yampa
66. yarrow

Bushes

1. blackberry
2. box elder
3. chinaberry
4. chokeberry
5. currant
6. elderberry (black, red)
7. gooseberry
8. mountain maple
9. salmonberry
10. serviceberry
11. squawbush
12. sumac
13. thimbleberry
14. twinberry

APPENDIX III
Animal Checklist

Mammals

1. badger
2. bats
3. bear
4. beaver
5. bighorn sheep
6. bobcat
7. chipmunk
8. coyote
9. deer
10. elk
11. fox (red, gray)
12. ground squirrel
13. marmot
14. marten
15. mice
16. mink
17. mountain lion
18. muskrat
19. otter
20. pika
21. pocket gopher
22. porcupine
23. rabbit (snowshoe hare)
24. shrews
25. skunk
26. squirrel (chickaree)
27. vole
28. weasel
29. woodrat

Birds

1. American goldfinch
2. bandtail pigeon
3. bewicks wren
4. bluebird (mountain)
5. chickadee
6. Clark's nutcracker
7. dove
8. eagle (bald, golden)
9. golden-crowned kinglet
10. grosbeak (pine)
11. grouse (blue, sage)
12. Hammond's flycatcher
13. hawk (red-tailed)
14. hermit thrush
15. horned lark
16. hummingbird
17. killdeer
18. Oregon junco
19. pine siskin
20. ptarmigan
21. red-shafter flicker
22. robin
23. rosy finch
24. sandpiper (spotted, western)
25. sparrow (white-crowned)
26. steller's jay
27. swallow (tree, violet-green)
28. turkey
29. water pipit
30. western dipper (ouzel)
31. western tanager
32. Wilson's warbler
33. woodpecker (hairy, brown-backed, Lewis)

APPENDIX IV
Natural Foods

We no longer live in an age when we may indiscriminately pick wild foods. If you want to sample the Indian's diet, please do so with great care and sensibility. Also, remember that several plants in the area are poisonous including many mushrooms, monkshood, larkspur, hemlock, death camas, etc.

Plant	Edible Portion	How to Prepare
Avalanche Lily	leaves, roots	eat raw or boiled
Bistort	root	boiled
Camas	bulb	roasted or boiled
Chokecherry	inner bark	cures diarrhea
Cow Parsnip	stem	peel and eat
Curly Dock	leaves	boil as greens
Currant	berries	raw or cooked*
Dandelion	young leaves	raw or boiled
Gooseberry	berries	raw or cooked*
Kinnikinnick	leaves	tea or as tobacco
Marsh Marigold	young leaves	boiled as greens
Mountain Parsley ("celery")	leaves, stems	seasoning
Nettles	leaves	boiled as greens
Onion	stems	insect repellent on skin
Oregon Grape	berries	raw or cooked, jelly, wine
Raspberry	berries	raw, boil leaves as tea
Red Elderberry	berries	raw or cooked, wine
Rose	hips	raw or boiled as tea
Salsify	root	roast or boil (like turnips)
Sego and Mariposa Lily	bulb	raw or baked as potato
Serviceberry	berries	raw or roasted
Shepherd's Purse	whole plant	mustard-like seasoning
Solomon Seal and False Solomon Seal	root	cooked as potato
Spring Beauty	bulb	raw or roasted
Squawbush	berries	makes sweet drink
Strawberry	berries,leaves	raw, boil leaves for tea
Thimbleberry	berries	raw or cooked
Thistle	young stems,roots	peel, boil 45 minutes
Twinberry	berries	raw and cooked*
Water Leaf	roots	roasted
Yampa	seeds, root	grind seeds, cook
Yarrow	leaves	medicinal tea, seasoning

*Many berries were dried by Indians and added to pemmican, a high-energy food made of dried fruit, dried meat, and fat.